

Uka Tarsadia University(Diwaliba Polytechnic)
Diploma in Chemical Engineering
Objective Type Questions (Mass Transfer – II)

UNIT- 1

DISTILLATION

1. In Azeotropic distillation _____ remains low.
 - a) Heat
 - b) Volatility
 - c) Relative volatility
 - d) None of the mentioned
2. Find the distillation preferred for the binary mixture having component A and B with vapour pressure 360mmHg and 355mmHg.
 - a) Multi-component distillation
 - b) Reactive distillation
 - c) Azeotropic distillation
 - d) All of the mentioned
3. The term entrainer used in
 - a) Multi-component distillation
 - b) Reactive distillation
 - c) Azeotropic distillation
 - d) None of the mentioned
4. By adding Entrainer the _____ azeotropes forms.
 - a) Low boiling
 - b) High boiling
 - c) No
 - d) None of the mentioned
5. The use of solvent for increasing the relative volatility is for
 - a) Multi-component distillation
 - b) Reactive distillation
 - c) Azeotropic distillation
 - d) Extractive distillation
6. In the distillate use of heat is to separate the distillate from the entrainer.
 - a) True
 - b) False
7. Find the Azeotropic mixture.
 - a) Air-water
 - b) Acetic acid- water

- c) Acetic acid- alcohol
 - d) Air-alcohol
8. If the feed mixture has the same vapour and liquid compositions at equilibrium then the distillation is normal.
- a) True
 - b) False
9. Will it possible to separate the mixture having relative volatility value 2 with azeotropic distillation.
- a) True
 - b) False
10. By adding entrainer or solvent one of the component's _____ gets reduced.
- a) Boiling point
 - b) Bubble point
 - c) Dew point
 - d) All of the mentioned
11. The overall Material balance, is given as
- a) $F = D+B$
 - b) $D = F + B$
 - c) $F = D+B$
 - d) $F=B-D$
12. The material Balance around a condenser, is given as
- a) $F = D+B$
 - b) $F = D+B$
 - c) $V = L+D$
 - d) $L= V + D$
13. . For a batch distillation process
- a) $-y dV = d(xW)$
 - b) $-x dV = d(xW)$
 - c) $-xW = d(yV)$
 - d) $-yW = d(xV)$
14. The below equation, holds well for?

$$\ln \frac{W_f}{W_0} = \int_{x_0}^{x_f} \frac{dx}{(y-x)}$$

- a) flash distillation
- B) simple distillation

C) multi component distillation

D) final distillation

15. If the integral part is given as -1.79 and still has 100 moles originally charged. Find the WF?

a) 15.8

b) 12.9

c) 16.7

d) 18.0

16. Find α . If $X_d=0.517$ and $X_w=0.3$

a) 1.3

b) 2.5

c) 5.6

d) 3.4

17. Calculate F? If $D=4.61$ and $W=5.39$

a) 7.8

b) 10

c) 9

d) 1.34

18. Batch distillation is also called as?

a) Flash distillation

b) Rayleigh's Criteria

c) Thompson Distillation

d) Crane Distillation

19. Flash distillation is called as?

A) Final distillation

B) Equilibrium distillation

C) Growth distillation

D) Full distillation

20. Which one of the following is a constant reflux process?

a) Flash distillation

b) Simple distillation

c) Multicomponent distillation

d) Final distillation

21. Batch distillation under constant reflux can be analyzed?

a) $-dw=dD$

b) $dv=-dx$

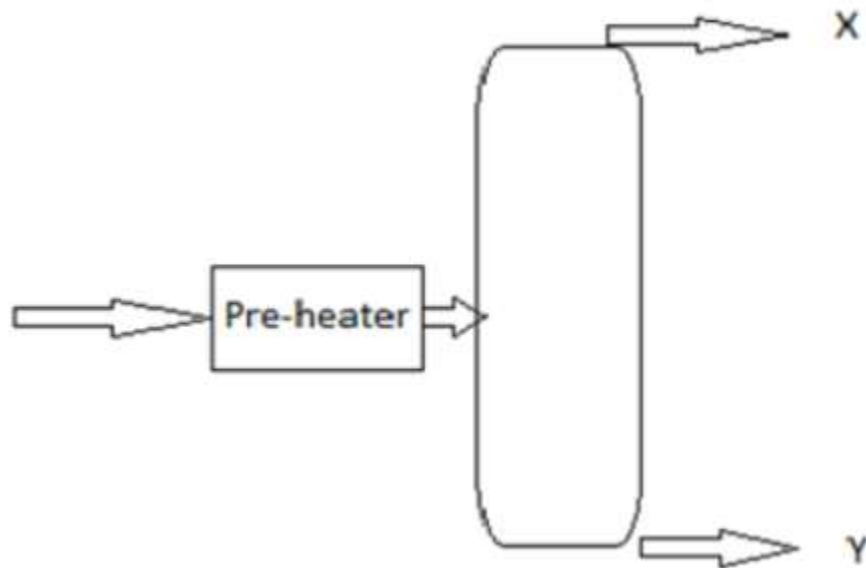
c) $-dy=dZ$

d) $dX=dy$

22. The initial mole fraction of gas, can be obtained by
- $X_d/R+1$
 - $-dw=dD$
 - $-dy=dZ$
 - $R+1$
23. As the distillation proceeds, the L/V ratio
- Constant
 - Decreases
 - Increases
 - Vanishes
24. Calculate V? If D = 52.2 moles and R is 1.64
- 138 moles
 - 35 moles
 - 450 moles
 - 46 moles
25. If the area of the column is 3.61 m^2 and the initial and final distilled moles are 0.95 and 0.50 with Withdrawal of 100 moles, then V is?
- 162
 - 456
 - 78
 - 45
26. The Antoine equation is given as
- $\ln P = B - A/CT$
 - $\ln P = A - B/T$
 - $\ln P = B - A/T$
 - $\ln P = B - CA$
27. Find R? If $X_d = 0.98$ and $Y_i = 0.647$
- 0.633
 - 0.589
 - 0.515
 - 0.25
28. The R_{act} can be taken, as
- $1.3R_{min}$
 - $1.6 R_{min}$
 - $2.0 R_{min}$
 - $3.0 R_{min}$
29. Calculate feed line q? If $H_V=31,067$, $H_F=34,601$ and $H_I= 0$
- 0.114
 - 0.36

- c) -0.556
d) 0.885
30. Bubble cap is a perforated tray with, additional
a) Trays
b) Camps
c) Pooches
d) Holes
31. The component balance of the component A is given as
a) $Fz_F = Dx_D + Wx_w$
b) $Fz_F = Dx_D - Wx_w$
c) $Fz_F = Dx_D / Wx_w$
d) $Fz_F = Dx_D * Wx_w$
32. If $F = 200$ kmol/h and $z_F = 0.4$, $x_D = 0.95$, $x_w = 0.04$ and $R = 2.0$, Then D is
a) 88.1
b) 22.6
c) 79.1
d) 158.2
33. The very First step of McCabe method is?
a) Plot the equilibrium curve
b) Plot diagonal curve
c) Plot Operating line
d) Plot stripping line
34. . Calculate Boil up? If vapor flow and bottom withdrawal are 237.3 and 120.9 respectively
a) 1.5
b) 2.9
c) 2.111
d) 1.963
35. If $Z_F = 0.6$ and also feed contains 72% mole of the liquid, then intercept of x axis is
a) 0.744
b) 0.899
c) 0.833
d) 1.2
36. Calculate minimum reflux? If intercept is 0.56 and $X_D = 0.96$
a) 0.174
b) 0.125
c) 0.21
d) 0.28
37. Slope of rectifying line is given by
a) R/X_D

- b) $R/(R+1)$
 - c) $F/(D+W)$
 - d) $R/(R+1)$
38. If $x_D=0.95$, $x_W=0.04$ and $\alpha=2.5$. Find total trays?
- a) 7
 - b) 6.7
 - c) 7.7
 - d) 6
39. A Pinch point may occur at intersection of feed line and
- a) Stream line
 - b) Stripping line
 - c) Rectifying line
 - d) Equilibrium line
40. Flash vaporization is a
- a) Equilibrium distillation
 - b) Differential distillation
 - c) Simple distillation
 - d) None of the mentioned
41. The feed is directly passed to the flash vaporization column
- a) True
 - b) False
42. Find the X and Y from the flash column given below



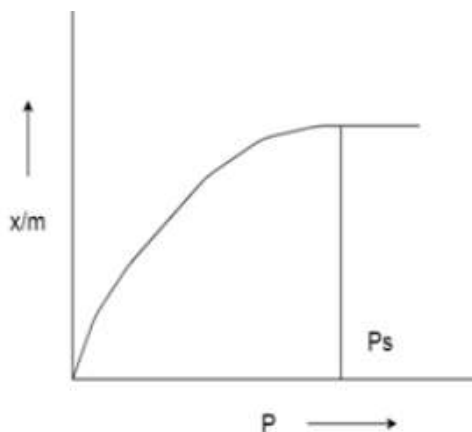
- a) X-more volatile, Y-less volatile
 - b) X-less volatile, Y- more volatile
 - c) X-non volatile, Y-less volatile
 - d) X-non volatile, Y-more volatile
43. Binary mixture of 100 kmol/hr enters into a flash drum has equimolar composition. The distillate obtained is 60 kmol/hr and the enthalpy of distillate, residue and feed are 500 KJ/kmol, 200 KJ/kmol and 400 KJ/kmol. Find the bottom flow rate in kmol/hr.
- a) 10
 - b) 20
 - c) 30
 - d) 40
44. Find the ratio of distillate to residual flow rates, if a binary mixture containing 65% of more volatile component while the distillate and the residue compositions are 90% and 30%.
- a) 0.4
 - b) 1.4
 - c) 2.4
 - d) 3.4
45. What happens to the liquid after preheating when enter to the cyclonic flash drum?
- a) Starts to evaporate
 - b) Split with centrifugal force
 - c) Comes out in residue
 - d) None of the mentioned
46. Express the flash vaporization
- a) Single stage operation
 - b) Multi component operation
 - c) Still operation
 - d) None of the mentioned
47. Find the distillate and the residue rates in mole/hr, if the feed rate is 100 mol/hr; The compositions of feed, distillate and residue in terms of mole fraction are 0.65, 0.9 and 0.2.
- a) 36,64
 - b) 64,36
 - c) 20,80
 - d) 80,20
48. Statement 1: Distillation is not used very widely in the food industry.
Statement 2: Steam distillation can be done when the volatile component is not miscible in water.
- a) True, False
 - b) True, True

- c) False, False
 - d) False, True
49. Out of the limited applications of distillation in the food industry, which of the following is an application?
- a) Use in brewer industry
 - b) Use in solvent recovery industry
 - c) Use in steam distillation
 - d) All of the mentioned
50. This method is used in food processing for removal of bad odours from food.
- a) Flash distillation
 - b) Steam distillation
 - c) Batch distillation
 - d) Gas adsorption

UNIT-2

ADSORPTION AND ION EXCHANG

1. Which of the following is not an adsorbent?
 - a) Carbon
 - b) Polymers and resins
 - c) Clay
 - d) Dry sponge
2. What do you mean by the term “Sorption”?
 - a) Attachment
 - b) Detachment
 - c) Diffusion
 - d) Thermal Expansion
3. The desorption curve is higher than the adsorption curve.
 - a) True
 - b) False(A)
4. Which of the following isotherm is applicable to physical adsorption?
 - a) Langmuir
 - b) BET
 - c) Freundlich
 - d) Kisluk
5. Which type of isotherm is given from the figure, Choose from the following options?



- a) Type 1 Adsorption isotherm
 - b) Type 2 Adsorption isotherm
 - c) Type 3 Adsorption isotherm
 - d) Type 4 Adsorption isotherm
6. Calculate the adsorption of a dye on activated carbon at 25°C, where $k = 0.025$, $n = 0.5$ and $C = 0.04$.
Based on the Freundlich isotherm.
 - a) 0.050
 - b) 0.030
 - c) 0.040
 - d) 0.060
 7. Which of the following statements regarding the physical adsorption of a gas on surface of solid is not correct?
 - a) On increasing temperature, adsorption increases continuously
 - b) Enthalpy changes are negative
 - c) Adsorption is specific
 - d) It is reversible in nature
 8. Which of the following is not characteristic of chemisorption?
 - a) It is irreversible
 - b) It is specific
 - c) It is multilayer phenomenon
 - d) Heat of adsorption is about 400kJ
 9. For an adsorbant-adsorbate system obeying the Langmuir adsorption isotherm, $b = 0.48 \text{ bar}^{-1}$ and $p = 0.16 \text{ bar}^{-1}$. At what pressure will 50% of the surface be covered?
 - a) 0.05 bar
 - b) 0.07 bar
 - c) 0.08 bar
 - d) 0.04 bar(B)
 10. Adsorption is an endothermic process.
 - a) True
 - b) False
 11. Chemical adsorption takes place at high temperature.
 - a) True
 - b) False

12. Which force holds the molecules in physical adsorption?
- Friction force
 - Van der waals force
 - Tension force
 - Nuclear force
13. What is the lowest enthalpy of adsorption for physical adsorption?
- 5 KJ mol^{-1}
 - 10 KJ mol^{-1}
 - 15 KJ mol^{-1}
 - 25 KJ mol^{-1}
14. Physical adsorption is also called as _____
- Adsorption
 - Absorption
 - Physisorption
 - Sorption
15. Chemical adsorption is also called as _____
- Sorption
 - Chemisorption
 - Chemiption
 - Chemical sorption
16. Physical adsorption _____ with increase in temperature.
- Decreases
 - Increases
 - Remains same
 - Fluctuates
17. Activated carbon removes microbial contaminants effectively.
- True
 - False
18. The filter once installed need not to be replaced in activated carbon filtration.
- True
 - False
19. _____ has high degree of porosity.
- Alum
 - Carbon
 - Aluminium
 - Zinc
20. Which of these are not removed by an activated carbon filter?
- TSS
 - Turbidity
 - Colour
 - Odour
21. In Langmuir's model of adsorption of a gas on a solid surface the mass of gas striking a given area of surface is _____ to the pressure of the gas.
- Proportional
 - Anti proportional

- c) Independent
 - d) None of the mentioned
22. Physical adsorption increase with _____ in temperature.
- a) Increase
 - b) Decrease
 - c) Neither increase nor decrease
 - d) None of the mentioned
23. The physical process that occurs when gas or liquid molecules are brought into contact with a solid surface and condense on the surface
- a) Absorption
 - b) Adsorption
 - c) Both Adsorption and Absorption
 - d) None of the mentioned
24. Adsorbent is a solid surface on which gas or liquid molecules condense to form a film. The above given statement is
- a) Correct
 - b) Incorrect
 - c) Partially correct
 - d) None of the mentioned
25. Adsorption when interaction between the solid and the condensed molecules is relatively strong as contrasted with physical adsorption.
- a) Absorption
 - b) Adsorption
 - c) Chemisorption
 - d) None of the mentioned
26. . The gas molecules are held on solid surface by _____ in physical adsorption.
- a) Chemical forces
 - b) Gravitational forces
 - c) Electrostatic forces
 - d) Vander Waal's forces
27. The extent of adsorption of a gas on a solid depend on
- a) Nature of gas
 - b) Pressure of gas
 - c) Temperature of the system
 - d) All of the mentioned
28. Which of the following gases is adsorbed by charcoal?
- a) NH_3
 - b) H_2
 - c) N_2
 - d) CO_2
29. Langmuir isotherm Mathematical relation for _____ that takes place at equilibrium.
- a) Absorption
 - b) Adsorption
 - c) Both Adsorption and Absorption
 - d) None of the mentioned

30. Adsorption process must be
- Endoethrgic
 - Endothermic
 - Exothermic
 - None
31. Ion-exchange resin is _____
- Linear
 - Low molecular weight
 - Organic polymer with porous structure
 - Soluble
32. Which of the following ion get released from the cation exchange column?
- H^+
 - Na^+
 - K^+
 - Ca^{+2}
33. Which of the following ion get released from the anion exchange column?
- CO_3^{-2}
 - OH^-
 - Cl^-
 - SO_4^{-2}
34. . Ion-free water coming out from the exchanger is known as _____
- Potable water
 - Disinfected water
 - Coagulated water
 - Demineralised water
35. Which of the following statement is incorrect about the demineralised water?
- It is as pure as distilled water
 - It is very good for use in high pressure boilers
 - It is fit for domestic use
 - It can be made either by distillation or by using cation and anion exchangers
36. The exhausted cation exchange column is regenerated by passing a solution of _____
- Dil. HCl
 - Dil. NaCl
 - Conc. HCl
 - Conc. NaCl
37. The exhausted anion exchange column is regenerated by passing a solution of _____
- Dil. KOH
 - Conc. KOH
 - Conc. NaOH
 - Dil. NaOH
38. In ion-exchange process, the capital cost is _____ and the operational expenses are _____
- Low, high
 - High, low

- c) High, high
 - d) Low, low
39. The residual hardness in ion-exchange process is _____
- a) 0-2 ppm
 - b) 5-10 ppm
 - c) 10-15 ppm
 - d) 20-30 ppm
40. The raw water used for ion-exchange process should be turbid.
- a) True
 - b) False
41. What principle is used in electrodialysis?
- a) Magnetic field and permeable membranes
 - b) Electric field and cation selective membranes
 - c) Electric fields and anion selective membranes
 - d) Electric fields and ion selective membranes
42. How is the arrangement of electrodialysis?
- a) 2 membranes arranged in alternating series pattern
 - b) 4 membranes arranged in alternating series pattern
 - c) 2 membranes arranged in simultaneous manner
 - d) 4 membranes arranged back to back
43. Why are the electrodes in electrodialysis neither oxidized nor reduced?
- a) Because they act as catalyst
 - b) Because they are chemically inert
 - c) Because no acid is present
 - d) There is no acid-base reaction involved in the process
44. What is true about electrodialysis?
- a) Most easily oxidizable species is oxidized at anode
 - b) Most easily reducible species is oxidized at cathode
 - c) Most easily oxidizable species is reduced at anode
 - d) The species don't get oxidized or reduced since the electrodes are inert.
45. Why is the electrode rinse solution acidic?
- a) To avoid the corrosion of electrodes
 - b) To avoid the formation of salts
 - c) To neutralize the OH⁻ ions
 - d) To make the electrodes acidic
46. What does haemodialysis removes other than harmful wastes?
- a) Protein
 - b) Salt
 - c) Insulin
 - d) Glycogen
47. Why is osmosis not a good separation process?
- a) Because it involves semipermeable membrane
 - b) Because it transfers solvent from wrong direction
 - c) Because it involves movement of solute particles
 - d) Because it requires high temperatures

48. What is the principle of reverse osmosis?
 - a) The direction of solvent flow Can be reversed by applying pressure greater than osmotic pressure
 - b) The direction of solvent flow can be reversed by applying pressure less than osmotic pressure
 - c) The direction of solvent flow can be reversed by using a permeable membrane
 - d) The solvent flow can be reversed by concentrating the mixture
49. Which of the following is not a use of reverse osmosis?
 - a) Treatment of industrial waste water to remove heavy metal ions
 - b) Separation of sulfites and bisulfites from paper and processing industry effluents
 - c) Treatment of municipal water to remove inorganic salts
 - d) Treatment of industrial effluents to decolorize it
50. Adsorption is a
 - A) surface phenomenon
 - B) bulk phenomenon
 - C) both A) and B)
 - D) none of these

UNIT-3

CRYSTALLIZATION

1. What type of size distribution occurs in batch crystallization?
 - a) Trimodal
 - b) Monomodal
 - c) Bimodal
 - d) No distribution occur
2. Which of the following is not a common method in reducing the rate of nucleation?
 - a) To control supersaturation
 - b) To keep low level of turbulence of mixing
 - c) To keep the slurry density low
 - d) To keep high level of turbulence of mixing
3. Find the initial rate of evaporation if
 Mass of seed= $M_s = 0.308$ kg,
 Solubility $C = 400$ kg/m³, $G/L_s = 3.75 \times 10^{-4}$
 - a) 0.05lit/min
 - b) 0.06lit/min
 - c) 0.07lit/min
 - d) 0.08lit/min
4. Find the initial rate of evaporation if
 Mass of seed= $M_s = 0.308$ kg,
 Solubility $C = 800$ kg/m³, $G/L_s = 3.75 \times 10^{-4}$
 - a) 0.05lit/min
 - b) 0.06lit/min
 - c) 0.07lit/min
 - d) 0.1lit/min

5. Which of the following is not a common method used for purification?
- Sublimation
 - Crystallisation
 - Electrolysis
 - Chromatography
6. Crystallisation is based on the _____
- Difference in melting point
 - Difference in boiling point
 - Difference in pressure
 - Difference in solubility
7. Which of the following is the example of crystallisation process?
- Purification of alum
 - Purification of sea water
 - Separation of gases from air
 - None of the mentioned
8. At room temperature, the impure compound in crystallisation is _____
- Soluble
 - Sparingly soluble
 - Insoluble
 - None of the mentioned
9. Which of the following is known as mother liquor?
- Solvent
 - Solute
 - Solution
 - Filtrate
10. The solution of impure compound and solvent is concentrated to get _____
- Unsaturated solution
 - Undersaturated solution
 - Saturated solution
 - Oversaturated solution
11. Insoluble impurities from solution during crystallization are removed by _____
- Drying
 - Filtration
 - Heating
 - Cooling
12. The solution which is obtained after filtration is _____
- Suspended solution
 - Clear solution
 - Colloidal solution
 - None of the mentioned
13. Crystal phases can be inter-converted by varying _____
- Temperature
 - Pressure
 - Size
 - Viscosity

14. The nature of the crystallization process is governed by _____
- a) Thermodynamics
 - b) Kinetic factors
 - c) Thermodynamics and Kinetic factors
 - d) None of the mentioned
15. What is the crystal size range of forced circulation crystallizer?
- a) 10-20mesh
 - b) 20-30mesh
 - c) 30-60mesh
 - d) 100-200mesh
16. Why the axial pump flow speed is preferred in forced circulation crystallizer?
- a) To reduce primary nucleation rate
 - b) To reduce the crystal size
 - c) To increase the crystal size
 - d) To keep the secondary nucleation rate small
17. What is the crystal size range of draft-tube-baffle crystallizer?
- a) 1-2 mesh
 - b) 30-60mesh
 - c) 8-30mesh
 - d) 100-200mesh
18. Which type of crystallizers does industry employ?
- a) Evaporative
 - b) Cooling
 - c) Sublimating
 - d) Boiling
19. What is not an advantage of using mechanical agitation?
- a) High purity
 - b) Uniform crystal size
 - c) High purity
 - d) Low rate of primary nucleation
20. What is the result of unagitated batch crystallizers?
- a) Undesirably large crystals
 - b) Impure crystals
 - c) Entrapment of mother liquor
 - d) High secondary nucleation rate
21. What ensures a reasonable heat transfer rate through a small temperature driving force?
- a) High agitation speed
 - b) High magma velocity
 - c) High nucleation rate
 - d) Low nucleation rate
22. What is the time for a typical cycle, including charging the feed, crystallization, and removal of the magma?
- a) 1 hour
 - b) 2-8hr
 - c) 7-15hr
 - d) 5-14hr

23. What is the specialty of the circulating liquor crystallizer?
- Supersaturation is created in separate region
 - Supersaturation is not created
 - Supersaturation is created at every point
 - Crystals are automatically thrown out of crystallizer
24. In the precipitation method for the growth of the crystal, the solvent melts are often known as _____
- Electrolyte
 - α -particle
 - β -particle
 - Fluxes
25. What is the disadvantage of using a solution growth method for the growth of the crystals?
- Rapid growth rates
 - Simple apparatus
 - Slow growth rates
 - Isothermal conditions
26. Allotropes differ in which of the following properties:
- Atomic Number
 - Atomic Mass
 - Crystal Structure
 - Electronegativity
27. Co-ordination number of a crystalline solid is:
- Number of particles in the unit cell
 - Number of nearest neighbours of a particle
 - Number of octahedral voids in a unit cell
 - Number of tetrahedral voids in a unit cell
28. Which of the following is a crystalline solid?
- Copper wire
 - Glass bottle
 - Polythene bag
 - Rubber ball
29. The smallest portion of a crystal which when repeated in different directions generates the entire crystal is called:
- Lattice points
 - Crystal lattice
 - Unit cell
 - None of the mentioned
30. The beginning of a new phase transformation is known as _____
- Nucleation
 - Growth
 - Segregation
 - Coring
31. In nucleation, particles having radius less than r_c are known as _____
- Nuclei
 - Embryo

- c) Element
 - d) Atom
32. How is the critical radius of particles calculated?
- a) $\frac{\gamma}{\Delta F_1}$
 - b) $\frac{2\gamma}{\Delta F_1}$
 - c) $\frac{\gamma}{vE}$
 - d) $\frac{2\gamma}{vE}$
33. In the homogeneous nucleation, nucleation rate is maximum _____
- a) At freezing point
 - b) Above boiling point
 - c) Below melting point
 - d) At room temperature
34. Heterogeneous nucleation differs from others due to _____
- a) Faster rate of nucleation
 - b) Supercooling
 - c) Wetting
 - d) Growth
35. In supercooled metals, the grain growth occurs in _____ manner.
- a) Dendritic
 - b) Pyramidal
 - c) Granular
 - d) Linear
36. Where does the solidification in a phase diagram start?
- a) Liquidus line
 - b) Solidus line
 - c) At equilibrium
 - d) At freezing point
37. Which of the following does not apply to non-equilibrium solidification?
- a) Porous
 - b) Dendritic
 - c) Inhomogeneous
 - d) Integrated
38. Micro-segregation pattern can be identified using _____ technique.
- a) Positron emission radiography
 - b) Single photon emission computed tomography
 - c) Magnetic resonance imaging
 - d) Autoradiography
39. Which of the following does not affects the pattern of segregation?
- a) Freezing rate
 - b) Motion of crystals

- c) Rate of solidification
 - d) Model of development of grain structure
40. There is _____ change in crystal structure during recrystallization.
- a) Major
 - b) Minor
 - c) No
 - d) Constant
41. On which factor does the recrystallization temperature depend?
- a) Purity
 - b) Density
 - c) Melting point
 - d) Grain size
42. During grain growth, the number of grains _____ in number.
- a) Increase exponentially
 - b) Increase constantly
 - c) Decrease
 - d) Do not change
43. Which of the following is NOT an important criteria for crystal formation?
- a) Caking characteristics of the crystal
 - b) Moisture content
 - c) Shape
 - d) None of the mentioned
44. Statement 1: The solubility of NaCl increases with the increase in temperature.
Statement 2: Crystal formation is hindered by nucleation taking place on the crystal surface.
- a) True, False
 - b) True, True
 - c) False, False
 - d) False, True
45. Solid food items containing water molecules are more soluble as the temperature increases.
Statement 2: This growth takes place in steps.
- a) True, False
 - b) True, True
 - c) False, False
 - d) False, True
46. Statement 1: Crystallization is both a mass and heat transfer operation.
Statement 2: The crystals and mother liquor obtained from a crystallizer are called _____
- a) True, nucleation
 - b) False, solid residue
 - c) True, magma
 - d) False, crystal growth
47. Parameters affecting crystallization are _____
- a) Agitator speed
 - b) Population density

- c) Purity of solution
 - d) All of the mentioned
48. Statement 1: Batch crystallizers are used if the throughput is high.
Statement 2: The operating cost of batch crystallizers is high.
- a) True, False
 - b) True, True
 - c) False, False
 - d) False, True
49. Scraped surface crystallizers can be used for viscous fluids up to 10000 cp.
- a) True
 - b) False
50. As the solidification progresses gradually inwards, small crystals with systematic orientation are formed.
- a) True
 - b) False

UNIT-4

LIQUID - LIQUID EXTRACTION

1. _____ is the single stage device in extractor types.
 - a) Mixer settler
 - b) Sieve trays
 - c) Agitator vessel
 - d) Packed column
2. Settler in the mixer settler is applicable for rapid agitation.
 - a) True
 - b) False
3. The substance to get mixed enters into the mixer through.
 - a) Orifice
 - b) Nozzle
 - c) Orifice or nozzle
 - d) None of the mentioned
4. The extractor preferred for getting immediate dispersion after piping is _____
 - a) Don extractor
 - b) Box extractor
 - c) Boltzmann extractor
 - d) Immediate dispersion is not possible

5. If a system has low interfacial tension _____ extractor is preferred.
 - a) Packed column
 - b) Pulse column
 - c) Sieve plates
 - d) Agitator column

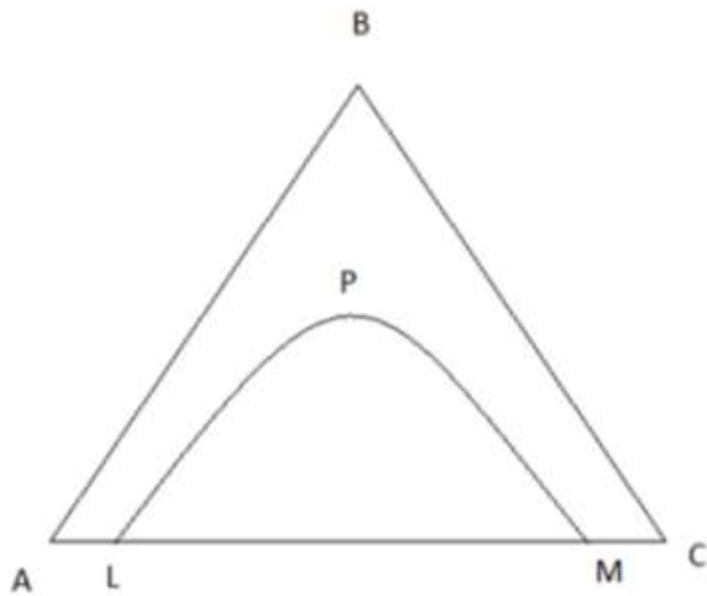
6. _____ mixing is applicable for differential contractors.
 - a) Axial
 - b) Radial
 - c) Both axial and radial
 - d) None of the mentioned

7. Packed tower with _____ packing preferable for liquid extraction.
 - a) Uniform
 - b) Random
 - c) Complete
 - d) None of the mentioned

8. Motivational force in a differential contractor is
 - a) Centrifugal force
 - b) Gravitational force
 - c) Electromagnetic forces
 - d) All of the mentioned

9. The extraction compositions in equilibrium are represented by equilateral triangle whose coordinates are known as
 - a) Isobar
 - b) Isotrope
 - c) Isotherm
 - d) None of the mentioned

10. Find LPM in the below one pair partially miscible ternary diagram.



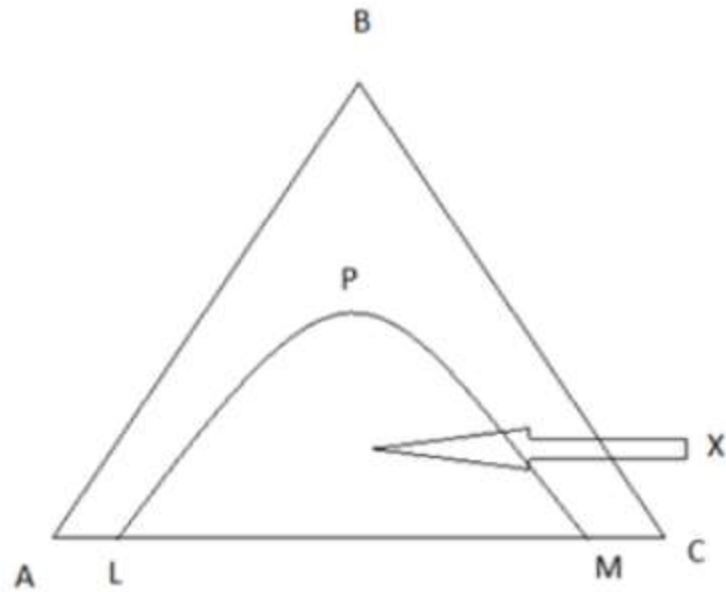
Where, A,B,C are the pure components

- a) Temperature curve
- b) Solubility Curve
- c) Solution curve
- d) Pressure curve

11. The change of solubility by adding other component gives rise to binodal solubility curve.

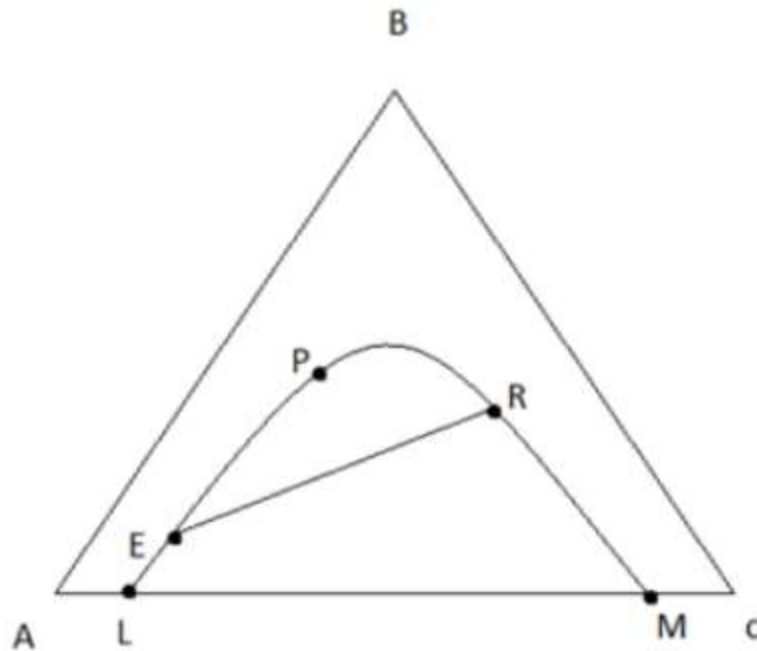
- a) True
- b) False

12. Justify that X represents heterogeneity of the solution.



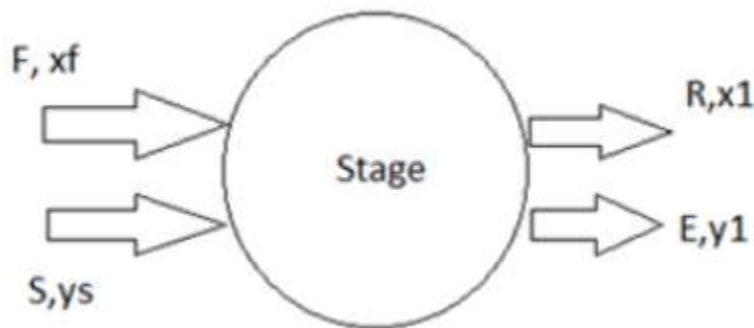
- a) True
- b) False

13. The system becomes solutropic if the tie line inside the binodal solubility curves becomes_____
- a) Vertical
 - b) Horizontal
 - c) Straight
 - d) None of the mentioned
14. The point where A and B rich solubility curve merge is known as _____



- a) Pinch point
 - b) Plait point
 - c) Key point
 - d) None of the mentioned
15. Separation is not possible at plait point.
- a) True
 - b) False
16. The plait point is the ____ tie line of the binodal curve.
- a) Last
 - b) First
 - c) Middle
 - d) None of the mentioned
17. Find the Distribution coefficient if equilibrium solute concentration in extract is 0.75 and the solute concentration in Raffinate is 0.6.
- a) 1.25
 - b) 0.8
 - c) 1
 - d) 0
18. The separation is possible if the solute concentration in both extract and raffinate are same.
- a) True
 - b) False

19. Stages in the extractor are _____
- Equilibrium stages
 - Theoretical stages
 - Equilibrium or theoretical stages
 - None of the mentioned
20. Extraction includes mixing alone.
- True
 - False
21. Every stage of extractor act as mixer and settler in the extraction process.
- True
 - False
22. If the pure solvent is used find the value of “ y_s ” by analysing the below single stage extractor



Where, F,S are feed and solvent

- 0
- 1
- 0-1
- None of the mentioned

23. Find the rate of extract in mol/hr if

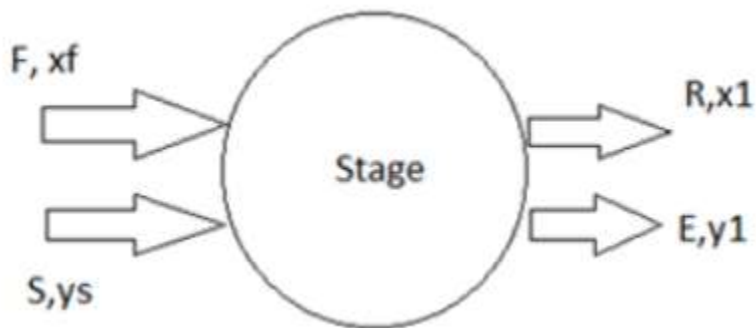
	Rate(mol/hr)	Composition
Feed	100	0.5
Solvent	50	0
Residue	25	0.25

- a) 100
- b) 125
- c) 150
- d) 50

24. Is the extraction is possible if a gas solvent is used for extracting solute from liquid mixture.

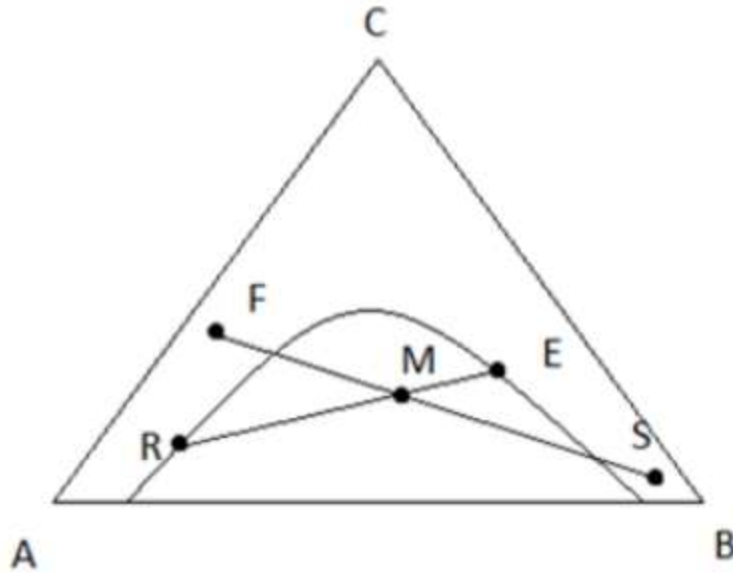
- a) True
- b) False

25. Find the process



- a) Single stage batch process
- b) Single stage continuous process
- c) Multistage continuous process
- d) None of the mentioned

26. Find the sum of R and E if the sum of F and S is 80 kmol.



- a) 20 kmol
- b) 40 kmol
- c) 60 kmol
- d) 80 kmol

27. Find the pure solvent rate if the feed ($F = 100$ kmol/hr) composition is 0.65 and mixture solute composition is 0.5.

- a) 10 kmol/hr
- b) 20 kmol/hr
- c) 30 kmol/hr
- d) 40 kmol/hr

28. Find the mixture composition of feed and pure solvent if the ratio of solvent to feed rate is 0.5 and the feed composition is 0.5.

- a) 0.5
- b) 0.25
- c) 0.33
- d) 0.4

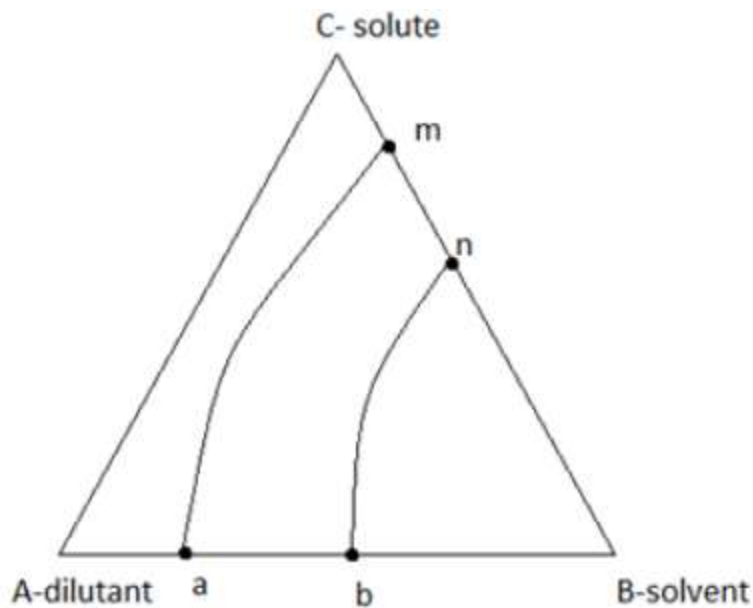
29. For extraction, the distribution co-efficient should be greater than 1.

- a) True
- b) False

30. The viscosity should be high for the solvents used in extraction operation.

- a) True
- b) False

31. The Azeotropic composition of the solute makes the extraction process economical.
 a) True
 b) False
32. Find the separation factor if the ratio of weight fraction of solute in the extract to raffinate is 0.75. Also given the ratio of dilutant in raffinate to extract is 0.5.
 a) 1
 b) 1.25
 c) 1.5
 d) 1.759
33. The separation is possible if the ratio of weight fraction of solute in extract to raffinate is 0.15. Also given the ratio of dilutant in raffinate to extract is 0.5.
 a) True
 b) False
34. The solvent used in the extraction should be more volatile.
 a) True
 b) False
35. By analysing this extraction equilibrium triangle, find the solvent requirement range



- a) Less solvent
 b) More solvent
 c) No solvent
 d) None of the mentioned

36. In extract, the usage of solvent should be less.

- a) True
- b) False

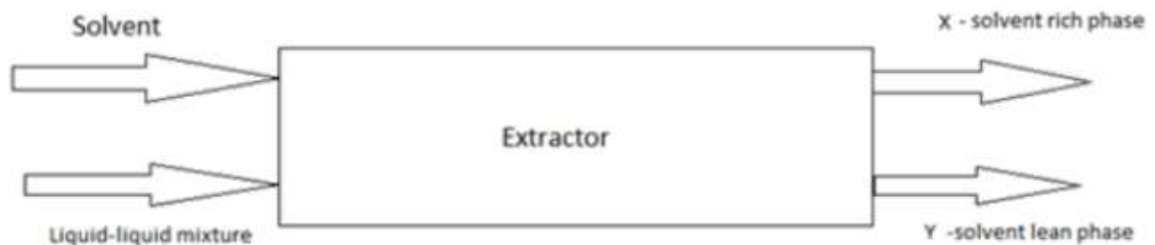
37. Solvent extraction is basically known as

- a) Gas-liquid extraction
- b) Liquid- liquid extraction
- c) Liquid –solid extraction
- d) None of the mentioned

38. . Liquid-liquid mixture is separated with solvent extraction by adding _____ solvent.

- a) Soluble
- b) Insoluble
- c) Partially soluble
- d) All of the mentioned

39. Find the representation X.



- a) Extract
- b) Raffinate
- c) Residue
- d) None of the mentioned

40. Solvent lean phase are known as

- a) Extract
- b) Raffinate
- c) Residue
- d) None of the mentioned

41. Will it be possible to separate multi-component solution with the help of two solvents.

- a) True
- b) False

42. The method of using two solvents is known as double solvent.
a) True
b) False
43. Fractional extraction is also known as _____
a) Solvent
b) Double solvent
c) Triple solvent
d) None of the mentioned
44. The composition of substances in the extraction are represented by _____
a) Rectangle
b) Isosceles triangle
c) Equilateral triangle
d) None of the mentioned
45. Which is the simple and the oldest technique for solvent extraction?
a) Spray column
b) Packed column
c) Plate column
d) Decanter
46. Why are the extraction rates in sieve plate columns high?
a) Because the dispersed droplets coalesce and reform on each plate
b) Because the dispersed droplets don't coalesce and reform on each plate
c) Because the dispersed droplets coalesce and not reform on each plate
d) Because the dispersed droplets neither coalesce nor reform on each plate
47. When the component has a small value of K , it is supposed to have an affinity for:
a) Mobile phase
b) No phase
c) Stationary phase
d) Whole solution
48. What is the use of ether layer?
a) To separate organic impurities
b) To separate inorganic impurities
c) To separate fibres
d) TO separate solvent
49. What is the representation of distribution coefficient?
a) S
b) H

- c) G
- d) K

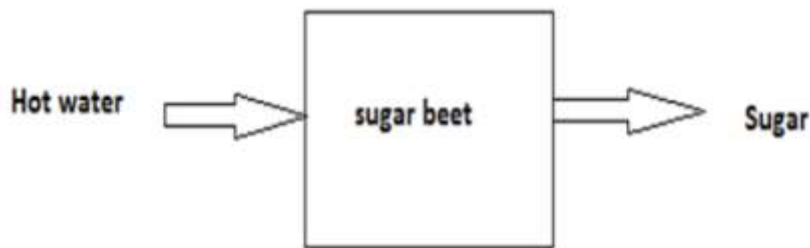
50. What is the colour post extraction of iodine?

- a) Blue
- b) Indigo
- c) Purple
- d) Red

UNIT-5

LEACHING

1. Wood ash leaching for alkali is known as _____
 - a) Lixivation
 - b) Lixartion
 - c) Lixation
 - d) None of the mentioned
2. The boiling point of the solvent is _____
 - a) Boiling solvent
 - b) Decoction
 - c) Leaching
 - d) None of the mentioned
3. The removal of soluble materials from the solid is known as _____
 - a) Elution
 - b) Decoction
 - c) Extraction
 - d) None of the mentioned
4. Leaching is generally used for cement industries
 - a) True
 - b) False
5. Find the process



- a) Leaching
 - b) Extraction
 - c) Evaporation
 - d) None of the mentioned
6. Which of the following process can accelerate leaching?
- a) Heating
 - b) Drying
 - c) Crushing
 - d) Crushing or grinding
7. The process elution is also known as elutriation.
- a) True
 - b) False
8. Temperature of the solvent is low.
- a) True
 - b) False
9. If the solvent viscosity is low and temperature of the solvent is high then the leaching rate decreases.
- a) True
 - b) False
10. In order to reduce the time required for the removing solute the sugar beets are cut into slices known as
- a) Cossettes
 - b) Coset
 - c) Consot
 - d) All of the mentioned
11. What does the solid-liquid separation operation don't involve?
- a) Gravity sedimentation
 - b) Magnetic separation

- c) Filtration
- d) Centrifugation

12. What process happens in leaching?
- a) A solvent separates a mixture
 - b) Two solvents separate a mixture
 - c) A solvent selectively dissolves one of the component
 - d) The mixture is heated so that one solid sublimates and is separated.
13. What happens in an ideal leaching stage of a mixture of A and B?
- a) The solvent dissolves Some B and some A
 - b) The solvent dissolves none of A and all B
 - c) The solvent dissolves all of A and B, which makes separation easier
 - d) The solvent does not dissolve any of A and B
14. What increases the solute concentration?
- a) Increasing viscosity of the liquid phases
 - b) Decreasing viscosity of liquid phases
 - c) Increasing temperature of liquid phases
 - d) Decreasing temperature of liquid phases
15. . Liquid-liquid extraction is called leaching.
- a) True
 - b) False
16. If extraction is done at the _____ of the solvent, it is called _____
- a) Melting point, decoction
 - b) Boiling point, decoction
 - c) Melting point, leaching
 - d) Boiling point, leaching
17. Statement 1: Soya bean has a high oil content.
Statement 2: If the oil content is high, extraction is done by solvent extraction alone.
- a) True, False
 - b) True, True
 - c) False, False
 - d) False, True
18. Oil seed cakes are obtained by _____
- a) Solvent extraction
 - b) Mechanical pressing
 - c) None of the mentioned
 - d) Solvent extraction & Mechanical pressing

19. Statement 1: Partition coefficient pertains to solid-liquid extraction.
Statement 2: Leaching involves both heat and mass transfer.
- a) True, False
 - b) True, True
 - c) False, False
 - d) False, True
20. Multi-stage counter-current extraction is expensive as more extractors are needed to strip the solid off the solvent.
- a) True
 - b) False
21. Statement 1: Multi-stage cross-current extraction – the solids contain some amount of solute after every extraction.
Statement 2: Single-stage batch extractor – Used in labs and not on large scale as a solvent is continuously subjected to heat.
- a) True, False
 - b) True, True
 - c) False, False
 - d) False, True
22. _____ is the diagonal of the x-y diagram.
- a) Operating line
 - b) Equilibrium line
 - c) Equilibrium curve
 - d) None of the mentioned
23. After extraction via solvent extraction, the cake serves to be a good source of _____
- a) Fats
 - b) Proteins
 - c) Carbohydrates
 - d) Fibers
24. _____ is an important solvent for wet and edible materials.
- a) Hexane
 - b) Acetone
 - c) Chloroform
 - d) All of the mentioned
25. What is extraction in paprika used for?
- a) Obtain proteins from the end product
 - b) Desolventization of final product
 - c) Extraction of its natural color
 - d) All of the mentioned

26. Statement 1: Caffeine is the active principle in coffee. It cannot be stripped off it.
Statement 2: Caffeine can be stripped off coffee by extraction.
- True, False
 - True, True
 - False, False
 - False, True
27. Using hot water for decoction followed by spraying drying is the procedure used for making instant coffee.
- True
 - False
28. If $Y_{N+1} = 0.0005$
 $X_N = 0.001$
 $Y_2 = 0.01174$
 $Y_L = X_L = 0.05$
 $L/V = 0.2295$
 Calculate the number of ideal countercurrent washing stages required.
- 2.5
 - 2.6
 - 2.8
 - 2.95
29. If $Y_{N+1} = 0.0005$
 $X_N = 0.001$
 $Y_2 = 0.01174$
 $Y_L = X_L = 0.05$
 $L/V = 0.35$
 Calculate the number of ideal countercurrent washing stages required.
- 2.5
 - 4.1
 - 2.2
 - 6.14
30. The rate of leaching depends on
- The particle size
 - The temperature
 - The agitation
 - All of these
31. With increase in temperature the rate of Extraction in leaching
- Increase
 - Decrease
 - Remain unaffected
 - Decreases linerally

32. An example of elution is
- A) Separation of uranium oxide from its ore by sulfuric acid in Pachuca tank
 - B) Separation of sugar from sugar feed by hot water
 - C) Dissolution of Tanin out of tree Barks by water
 - D) Recovery of vegetable oil from seeds
33. Desulphurization of petrol is done in
- A) Bollman Extractor
 - B) Rotating disc extractor
 - C) Packed extraction column
 - D) Plate type extraction column
34. Which of the following solid liquid extractor is used for concentration of radioactive nuclear waste
- A) Pulsed column extractor
 - B) Sieve plate extractor
 - C) Mixer settler extractor
 - D) Ballman extractor
35. Coffee is prepared from coffee beans by leaching with
- A) Cold water
 - B) Hot water
 - C) Naptha
 - D) Hot sulfuric acid
36. Bollman extractor_____
- A) Contain a Bucket in closing casing
 - B) Contain a bucket in Open casing
 - C) Contain fine blades
 - D) None of these
37. Which of the following is not used as solvent
- a) Acetone
 - b) hexane
 - c) Iso-butylketon
 - d) Acetaldehyde
38. How can the partition coefficient be increased?
- a) By increasing the feed
 - b) By decreasing the feed
 - c) By changing pH
 - d) By increasing chemical potential
39. What happens after critical micelle concentration CMC?
- a) Micelles stop forming
 - b) Micelles cannot form

- c) Micelles start forming
 - d) Solubility is maximum
40. Pick out the correct statement /s .
- a) In case of liquid liquid extraction, no separation is possible, if the selectivity of solvent used is unity
 - b) With increase in temperature, the selectivity of the solvent used in solvent extraction decreases
 - c) The selectivity of the solvent is unity at the plait point
 - d) All of the above
41. The rate of solid liquid extraction is limited by the
- a) Phase change of solute as it dissolve in the solvent
 - b) Diffusion of the solute through the solvent in the pores to the outside of the particles
 - c) diffusion of the solute from the solution in contact with the particle to the main bulk of the solution
 - d) all 'a', 'b' & 'c'.
42. Bollman extractor
- a) Is a static bed leaching equipment.
 - b) Is used for extraction of oil from oilseed.
 - c) Is a centrifugal extractor.
 - d) employs only counter-current extraction.
43. in a Rotocel extractor _____
- a) the horizontal basket is divided into wall compartment,
 - b) vertical basket is divided into wall compartment
 - c) basket rotates slowly in axial axis
 - d) none of these
44. a series of pressure tank operated with counter current solvent flow is known
- a) diffusion battery
 - b) shanks process
 - c) cell
 - d) none of these
45. which of the following is not aoperation of leaching
- a) concurrent
 - b) counter current
 - c) solid liquid
 - d) liquid liquid

46. if the liquid flow rate increases the slope of operating line in leaching
- a) decreases
 - b) increases
 - c) remain same
 - d) none of these
47. in leaching the amount of soluble material removed is often _____ than ordinary in filtration washing
- a) greater
 - b) lesser
 - c) Data insufficient
 - d) none of these
48. moving bed leaching operation is not done in
- a) Bolmaan extractor
 - b) rotocel extractor
 - c) mixer settler extraction
 - d) none of these
49. Dorr thickner is equipment of
- a) leaching
 - b) sedimentation
 - c) classifier
 - d) none of these
50. The boiling point of the solvent is _____
- a) Boiling solvent
 - b) Decoction
 - c) Leaching
 - d) extraction

UNIT-6
MEMBRANE SEPARATION

1. Which of the following is not an application of transport in membranes?
 - a) Microfiltration
 - b) Reverse osmosis
 - c) Dialysis
 - d) Fractional distillation
2. What cannot be a size of membrane?
 - a) Nano porous
 - b) Macroporous
 - c) Microporous
 - d) Non-porous
3. If the pressure drop(ΔP) is 1000 units, the flux(J) is 50 units, what is the hydraulic membrane permeability?
 - a) 0.02
 - b) 0.04
 - c) 0.05
 - d) 0.06
4. Pore size Micro-filtration membrane ranges from _____
 - a) 0.1- 5 μm
 - b) 0.1- 0.01 μm
 - c) 0.001- 0.01 μm
 - d) 0.0001- 0.001 μm
5. Pore size Ultra-filtration membrane ranges from _____
 - a) 0.1- 5 μm
 - b) 0.1- 0.01 μm
 - c) 0.001- 0.01 μm
 - d) 0.0001- 0.001 μm
6. Pore size Nano-filtration membrane ranges from _____
 - a) 0.1- 5 μm
 - b) 0.1- 0.01 μm
 - c) 0.001- 0.01 μm
 - d) 0.0001- 0.001 μm
7. Pore size RO membrane ranges from _____
 - a) 0.1- 5 μm
 - b) 0.1- 0.01 μm
 - c) 0.001- 0.01 μm
 - d) 0.0001- 0.001 μm
8. The solution to be concentrated or fractionated is called?
 - a) Feed

- b) Flux
 - c) Membrane fouling
 - d) Permeate
9. The term for deposition of solids on the membrane, irreversible during processing is?
- a) Feed
 - b) Flux
 - c) Membrane fouling
 - d) Permeate
10. The concentrate, the retained liquid is called _____
- a) Permeate
 - b) Retentate
 - c) Concentration factor
 - d) Diafiltration
11. What is the volume reduction achieved by concentration, i.e. the ratio of the initial volume of feed to the final volume of concentrate called?
- a) Permeate
 - b) Retentate
 - c) Concentration factor
 - d) Diafiltration
12. _____ is a modification of ultra filtration in which water is added to the feed as filtration proceeds in order to wash out feed components which will pass through the membranes, basically lactose and minerals.
- a) Permeate
 - b) Retentate
 - c) Concentration factor
 - d) Diafiltration
13. Which of the following membrane separation technique would be most suitable for dehydration of whey in dairy industry?
- a) Reverse osmosis
 - b) Nano filtration
 - c) Ultra filtration
 - d) Membrane filtration
14. Which of the following membrane separation technique would be most suitable for partial desalination of whey in dairy industry?
- a) Reverse osmosis
 - b) Nano filtration
 - c) Ultra filtration
 - d) Membrane filtration
15. Which of the following membrane separation technique would be most suitable for the concentration of milk proteins in dairy industry?
- a) Reverse osmosis
 - b) Nano filtration
 - c) Ultra filtration
 - d) Membrane filtration
16. Which of the following membrane separation technique would be most suitable for

- the reduction of bacteria in skim milk?
- a) Reverse osmosis
 - b) Nano filtration
 - c) Ultra filtration
 - d) Membrane filtration
17. What is the Processing temperature in membrane filtration applications?
- a) 15°C
 - b) 25°C
 - c) 65°C
 - d) 50°C
18. The separation limit for a membrane is determined by the lowest _____ that can be separated.
- a) Fractional weight
 - b) Molecular weight
 - c) Ion weight
 - d) Mass
19. Which of the following mechanisms is used by a membrane filter to remove particulate material from the water?
- a) Adsorption
 - b) Settling
 - c) Straining
 - d) Crystallization
20. The membrane filtration level with the smallest pore size (0.0001 – 0.001 μm) is called _____
- a) Micro filtration
 - b) Reverse osmosis
 - c) Nano filtration
 - d) Ultra filtration
21. The flow rate through the membrane filter itself expressed as a gallon per square foot per day is called?
- a) Permeate
 - b) Head loss
 - c) Flux
 - d) Overhead
22. Which one of the following is the name of the process of reversing the direction of water flow through the filter using filtered water?
- a) back pulse
 - b) reverse flow
 - c) air pressure
 - d) front pressure
23. The filtered water that has been treated by a membrane filter is called _____
- a) Permeate
 - b) Concentrate
 - c) Reject
 - d) Pulp

24. Which of the following remains the primary use of membrane filtration in water treatment?
- Desalination of salt water to produce potable water
 - A pretreatment step in water treatment
 - Filtration of surface or ground water under the direct influence of surface water
 - Pre heating
25. Which of the following are different forms of membrane filter construction?
- Hollow filter
 - TMP
 - Spiral wound
 - Ceramic
 - Cross flow
 - Electro dialysis
- I), III) IV) and VI)
 - I),II),III) and IV)
 - I) and II)
 - III) and IV)
26. A raw water reservoir would be an example of which membrane pretreatment method (where the goal is to reduce the loading and fouling potential of the water fed to the membrane)?
- Filtration
 - Clarification
 - Chemical treatment
 - Pasteurization
27. . Which of the following is a valid name for a test for testing membrane integrity?
- Flux membrane test
 - Reversal of flow test
 - Air pressure hold test
 - Sediment test
28. Chlorines, acids, and bases are three types of chemicals used to do which of the following?
- prescreen the water in the membrane filtration system
 - chemically clean a membrane filtration system
 - monitor a membrane filtration system for fiber failure
 - filter
29. Which of the following mechanisms is not used by a membrane filter to remove particulate material from the water?
- flux
 - reverse flow
 - particle counts
 - chlorine
30. For surface water system, the required residual disinfectant concentration may not be less than _____ mg/L for more than _____ hours before the first customer.
- 0.2, 6
 - 2.0, 6

- c) 0.2, 4
 - d) 2.0, 4
31. What is a membrane module?
- a) A membrane module is a representation of the type of pores in a membrane
 - b) A membrane module is a unit housing the membrane
 - c) A membrane is representation of an ideal membrane
 - d) A membrane module is representation of the concentration changes during separation
32. What is the use of cross flow in plate and frame module?
- a) Reduces fouling
 - b) Reduces loss
 - c) Reduces efficiency
 - d) Increases efficiency
33. What is the packing density of plate and frame module?
- a) $100\text{-}400\text{m}^2/\text{m}^3$
 - b) $500\text{-}100\text{m}^2/\text{m}^3$
 - c) $200\text{-}400\text{ m}^2/\text{m}^3$
 - d) $500\text{-}1000\text{ m}^2/\text{m}^3$
34. Which membrane module represents a spiral heat exchanger?
- a) Plate and frame module
 - b) Spiral wound module
 - c) Hollow fibre module
 - d) No module exists
35. What is the life spiral-wound module?
- a) 2 months
 - b) 10years
 - c) 2-3 years
 - d) 5-9 years
36. What is the packing density of hollow-fibre module?
- a) $200\text{ ft}^2/\text{ft}^3$
 - b) $4000\text{ ft}^2/\text{ft}^3$
 - c) $5000\text{ ft}^2/\text{ft}^3$
 - d) $10000\text{ ft}^2/\text{ft}^3$
37. Why is there a chance of fouling in hollow fibre module?
- a) Fibres form a bundle and there is little free space
 - b) High packing density
 - c) Narrow pores
 - d) Excessive density of membrane material
38. What is the alternate feed and permeate regions in plate and frame modules called as?
- a) Spacers
 - b) Stop disk
 - c) Tie rod
 - d) Channel
39. Which module is preferred for reverse osmosis operation?
- a) Hollow fibre module

- b) Plate and frame module
 - c) Spiral wound module
 - d) No module is used
40. What is the membrane that selectively allows certain species to pass through called?
- a) Permeable membrane
 - b) Semi-permeable membrane
 - c) Impermeable membrane
 - d) Membrane
41. The chlorine resistant polyamide membranes are prepared from aliphatic polypiperazine amides.
- a) True
 - b) False
42. Which of the following materials is not used in the preparation of nanocomposite support membranes?
- a) Silica (50 nm)
 - b) Zeolite (250 nm)
 - c) Silica (120 nm)
 - d) Zinc (135 nm)
43. What is the pore size of LTA-type zeolite nanoparticle?
- a) 0.2 nm
 - b) 0.4 nm
 - c) 0.6 nm
 - d) 0.8 nm
44. What is the material used in the making of NS-200 membrane?
- a) Sulphonated polyfuran
 - b) Sulphonated polysulphone
 - c) Polypiperazine-amide
 - d) Aromatic polyamide
45. What is the percentage of salt rejection of NS-100 RO membrane?
- a) 99.8%
 - b) 99 %
 - c) 98.5 %
 - d) 97 %
46. Which type of membrane is required for water permeation?
- a) Hydrophobic
 - b) Hydrophilic
 - c) Semipermeable
 - d) Permeable
47. Pervaporation method involves
- a) Removal of ions
 - b) Production of potable water
 - c) Purification of aqueous streams
 - d) Separation and concentration of liquid mixture.
48. When is the pervaporation preferred?
- a) When feed solution is dilute in main permeant
 - b) When feed solution is rich in main permeant

- c) When feed solution is dilute in retentate
 - d) When feed solution is rich in retentate
- 49.** What factor is unaccountable in gas permeation?
- a) Temperature
 - b) Polymer
 - c) Permeant
 - d) Concentration of permeants
- 50.** What are the permeant vales, if permeant flux(N)= 10
For feed side liquid: $Y=0.5$, $x= 0.5$
Vapor pressure = 100
Mole fraction of permeant vapor $y= 0.25$
Total permeant pressure $P= 80$
- a) 2
 - b) 4
 - c) 5
 - d) 7